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N284 N295 N297 N298 N374 N378 N380 N386 N387  
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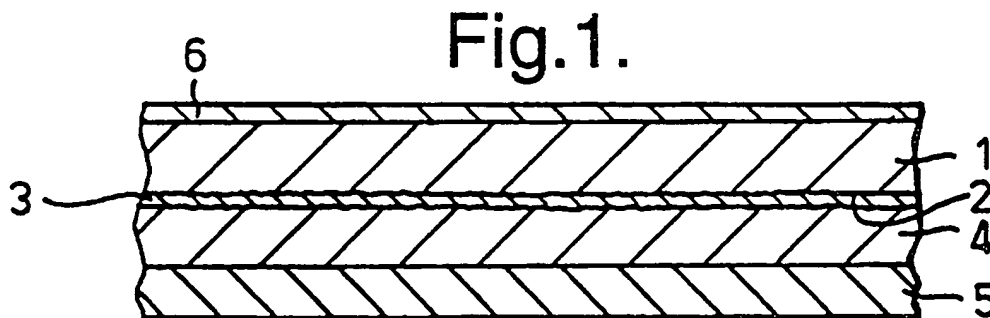
EP 0345405 A2 US 5005719 A

(58) Field of Search

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(54) Tamper Indicating Security Item

(57) A tamper indicating security item such as a shrink wrap seal comprises a substrate 4 including an optically variable effect generating structure such as an embossed hologram 2. Each surface of the substrate 4 carries an adhesive 1,5 having a strength such that after the substrate has been adhered to a surface it cannot be removed without damaging the optically variable effect generating structure.



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Fig.1.

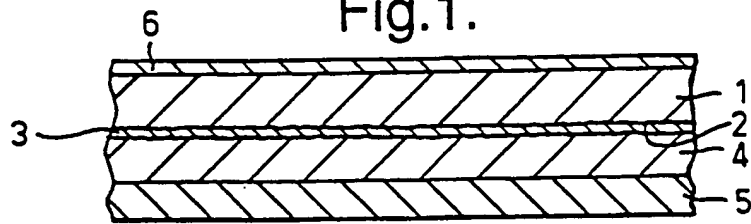


Fig.2.

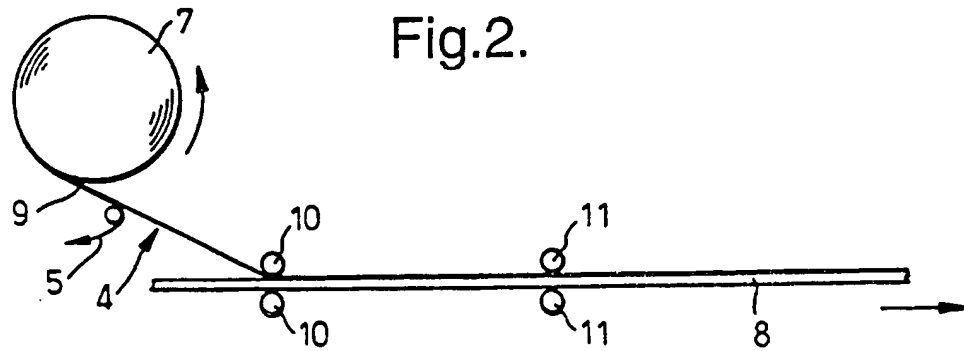


Fig.3.

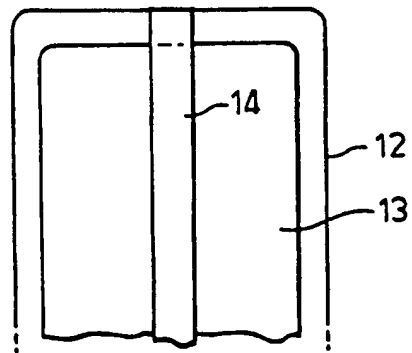
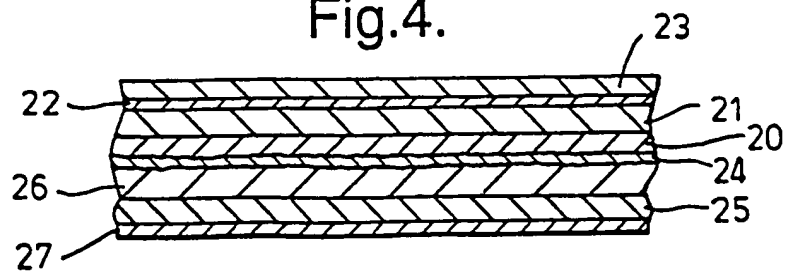


Fig.4.



TAMPER INDICATING SECURITY ITEM  
AND JOINING METHOD

5        This invention relates to a tamper indicating security item and a joining method and is particularly useful in packaging applications.

10       The market penetration of optically variable effect generating devices such as holographic security devices is increasing and new ways to use such devices are constantly being developed. Holographic security devices require sophisticated equipment for their manufacture and this combined with their visual effectiveness makes them highly desirable as anticounterfeiting and antitamper features.

15       Holographically imaged labels can be provided on a variety of security articles. Films exhibiting holographic images or other light diffracting patterns are available for the packaging industry as plain wrapping films.

20       To prevent and/or allow the detection of tampering with goods including fast moving consumer goods, many manufacturers have introduced tamper resistant or tamper indicating packing. For example, plastic seals are often shrunk over the closures of bottles to prevent or allow the detection of any tampering with the contents of the bottle.

25       Shrink sleeve or shrink wrap packaging is well known. The underlying principle behind this is that a mono-axially or biaxially orientated thermoplastic polymeric film is placed over the article to be protected as a loose fit. When the film is heated to above a certain temperature, the plastic shrinks as the strain imparted during the orientation process is released.

30       Smurfit Precision Labelling has recently introduced an holographic tamper evident shrink sleeve for use in the packaging industry. Here a type of shrink wrap film is made and this has a holographic band affixed to it which is perforated.

35       To open the protected closure, the shrink wrap film is removed: the removal action causes tearing along the line

of perforations to cut the holographic device in two. Such films may be poly (vinyl chloride) or a polyester such as poly(ethylene terephthalate). It is also possible, however, to slit the sleeve elsewhere and remove the sleeve  
5 without damaging the holographic device.

Holographic tear tapes are also offered by Applied Holographics Ltd along with PP Payne Ltd.

Packaging material with an holographic pattern is disclosed in WO 93/08084 and holographic adhesive tape is  
10 disclosed in EP 585076A.

Transferable holographic packaging films are disclosed in GB-A-2069409.

Tamper evident holographic labels for adhering to a surface are also known in which when the upper layer is  
15 mechanically peeled away delamination at the interface between the metallic reflective coating and the finely embossed diffractive surface occurs. In such instances when the layers are separated, they cannot be recombined and the loss of such intimate layer contact means that the  
20 holographic effect is immediately, unexpectedly and irreversibly destroyed.

Polypropylene tamper evident labels can withstand the conditions required for hot lamination if the correct grade and surface bonding characteristics are employed, and  
25 because of their strength, polyester holographic labels are generally tamper resistant. However, they can be cut and removed and then used on counterfeit or tampered products although they can be treated or be provided with added layers to reduce this problem.

30 US Banknote Co (USBC) makes a polyester hologram and coats this on both sides with a hot melt adhesive. Then one of the adhesive layers is coated with a diamond pattern of a pressure sensitive adhesive ("psa"). This psa is used to hold the hologram in position when the core is labelled  
35 prior to the single ply poly(vinyl chloride) film being applied.

USBC has used the approach of adhering the hologram to the surface of the security printed plastic, for example by an automatic labelling machine, subsequent to which the single ply PVC laminating film is applied.

5 In accordance with one aspect of the present invention, a tamper indicating security item comprises a substrate including an optically variable effect generating structure, each surface of the substrate carrying an adhesive having a strength such that after the substrate  
10 has been adhered to a surface it cannot be removed without damaging the optically variable effect generating structure.

We have devised a new type of security item which has a particular use in packaging by providing a strong bond  
15 between the packaging material and the packaged article and which, when broken, inevitably damages or destroys part or all of the optically variable effect generating structure. A particular example is tubular, shrink wrap seals. It could also be used in other applications which require a  
20 tamper indicating facility.

Typically, the adhesive used on one surface of the substrate will be different from that used on the other surface. However, this is not essential.

In accordance with a second aspect of the present  
25 invention, a method of joining two surfaces comprises adhering each surface to a respective side of a substrate including an optically variable effect generating structure using one or more adhesives, the or each adhesive having a strength such that after the substrate has been adhered to  
30 a surface it cannot be removed without damaging the optically variable effect generating structure.

This aspect of the invention is particularly suited to packaging applications in which one surface constitutes an article to be packaged and the other surface is formed by  
35 a packaging material. The adhesive could be provided on the two surfaces prior to application to the substrate or

one or both of the adhesives could be provided on the substrate.

One of the adhesives, for example for adhering the substrate to a packaging film may be one of an hot melt adhesive, an heat activatable adhesive, a pressure sensitive adhesive and a polymeric laminating film.

The other adhesive, for example for adhering the substrate to the article may be one of an hot melt adhesive, a heat activatable adhesive, a pressure sensitive adhesive, and a hot melt adhesive cross linkable in nature such as UV cured acrylic or epoxy. This is especially useful if windows are employed i.e. demetallised holograms or clear refractory hot stamping holographic foils. UV curing is effected whilst the adhesive is in the melt phase.

All these adhesives achieve strong bonds to the substrate and surfaces.

Generally, these adhesive materials will be transparent when actively bonded. However, one or both adhesives could be provided with luminescent materials or be tinted and translucent while one of the adhesives could even be opaque provided the optically variable effect was visible through the other.

In one preferred embodiment, the one adhesive is selected from a hot melt adhesive or a pressure sensitive adhesive, and the other adhesive is a hot melt adhesive.

In some cases, at least one of the adhesives includes a marking material such as a visible dye, a luminescent material, and/or a magnetic material. This can provide additional security. For example, secondary detection is possible if a luminescent material such as a phosphorescent chemical is included while visual dyes and magnetic materials can be used to provide codes.

In a preferred embodiment of the tamper indicating security item, the substrate has on one surface a pressure sensitive adhesive protected prior to use by a detachable release layer and on the other surface an heat activatable

or hot melt adhesive layer material or solid UV cationic epoxy which melts and then cures with UV. Where the item is used with shrink wrap, curing will occur immediately after the shrink stage.

5       The adhesive coatings are generally intended to be evenly coated but patterns of adhesive such as a fine grid could be used. In this case, the adhesives could be printed by screen printing means.

10       The optically variable effect generating structure may be of the type in which the visual effect results from the interference of white light. The light interfering structures are formed by a number of alternating coatings of a metal and another metal or a light refracting coating such as magnesium fluoride or zinc sulphide. Such  
15   multilayer light interfering structures are well known in the art.

      Such light interfering structures will typically exhibit a coloured metallic sheen at a certain angle of viewing with reference to a fixed position white light  
20   source and at other angles the colour and appearance will be different. At certain angles, the effect may be seen substantially to vanish. Such multilayer light interfering structures are valuable anticounterfeiting devices as their manufacture is very difficult and requires precision  
25   equipment.

      In addition, the optically variable light effect generating structure could be an holographic effect generating structure which is intended to include also all types of white light diffracting surface relief patterns  
30   formed in a polymeric medium in which the patterned surface is reflectively or refractively coated with an image enhancing composition such as a thin layer of aluminium or a thin layer of magnesium fluoride or zinc sulphide. Such coatings and equivalents are well known in the art and  
35   examples may be found in EP 201323A. The aluminium or other films could be provided in a continuous form or fine halftone dot formation as described in EP 328086A.

The visual appearance resulting from such diffracting structures may thus be of a regular diffraction grating, a mosaic of diffracting gratings, a three dimensional holographic spatial effect image or the like. Such diffracting structures can be generated by holographic recording or electron beam generation. For example, the optically variable effect generating structure may generate an holographic effect at least in one visually identifiable area, the structure being formed by a fine surface profile formed in a transparent plastic film, the profile being reflectively coated.

On delamination the visual appearance will substantially change although if some layers are intact the delaminated portions may exhibit other coloured effects.

The substrate is self-supporting and is preferably in the form of a plastics film. The optically variable effect generating structure is preferably formed as a surface relief pattern in the substrate or into a layer on the substrate. This could be achieved, for example, by using thermoplastic moulding methods using a nickel or other shim as an embossing tool. The additional layer could be a lacquer layer provided directly on the substrate or on an additional carrier.

The self-supporting plastics film may be poly(vinyl chloride), poly(propylene), poly(ethylene), poly(ethylene terephthalate) or other polyester, a polyacrylic or polyacrylate, poly(vinylidene chloride) or poly(styrene). Copolymers of the foregoing may also be used.

For some applications, suitable polymeric films may be axially orientated.

Thermoplastic embossable lacquer coatings carried on a polymeric carrier, e.g. PET, may be added to the above films.

It is preferred that the polymeric material be a transparent poly(propylene) film which has been diffractively embossed and coated with a thin film of aluminium.



Mono-axially orientated films have typical shrink characteristics of 55% in the traverse direction and 6% in the machine direction. There are a wide range of material thicknesses, e.g. 38 microns to 100 microns, reversion temperatures and other characteristics possible.

The invention is particularly suited for use in packaging articles. In these applications, one of the surfaces to which the substrate is bonded is a packaging film and the other the article to be packaged. In this context, the article may only be partially packaged. For example, a lid only of the article could be covered by a packaging film.

The packaging film may be a film selected from a biaxially orientated thermoplastic film or a monoaxially orientated thermoplastic film.

Typically, the packaging film is applied to the item and heat is applied, preferably as heated air such that the heat activatable surface of the hologram adjacent the article bonds to the article in the manner required for the operating of the invention.

An advantage of the present invention when used with packaging is that the (holographic) effect may be readily imparted to the packaged article and its presence can testify to the authenticity of the article.

When the packaging is removed, the (holographic) image will unexpectedly and immediately fail in a manner which cannot be reconstructed. Thus, any attempts to remove the packaging will leave an immediate trace.

The invention is particularly suitable for use in some embodiments for high capacity production packaging lines, for example the fast moving consumer goods sector. In other embodiments, individual packages of high value items may be prepared.

Such packaging may be used in the packaging of cylindrical containers such as polycarbonate bottles for beverages. In this instance, the removal of the packaging wrap will cause the hologram to fail.

The adhesive(s) can be activated in a variety of ways depending upon their nature and the manner in which they are incorporated into the item and/or packaging film/article.

5        In one particularly convenient embodiment in which a hot melt adhesive is used to bond the substrate to the article and a pressure sensitive adhesive is used to bond the substrate to the packaging film, heat is applied which simultaneously causes the film to shrink and at the same  
10       time causes the hot melt adhesive on the rear of the substrate to bond to the article.

      A further advantage of the invention is that when wrappings are legitimately removed the (holographic) effect is destroyed so removing the potential that the discarded  
15       wrapper could be re-used.

      The packaging film will typically be a plain transparent film but in some cases could itself carry an optically variable effect generating structure such as a holographic generating effect structure.

20       Tubes of biaxially orientated film may be made for shrink wrap purposes by firstly taking a film of thickness around 70 microns and forming a seam by heat welding, solvent bonding, ultrasonic welding or radio frequency bonding. Such films will generally be printed with a  
25       packing design by rotogravure or flexography and the holographic construction applied. For example, the holographic material may be applied by supplying it in a core having on one surface a non-tacky hot melt adhesive and a pressure sensitive adhesive on the other surface,  
30       this being protected by a releasable paper. In practice, the tamper evident strip or tape is applied to the packaging sheet while it is laid flat and this is then seamed into tubes from which shorter shrink-sleeves are cut.

35       Typically, the packaging film with shrinkable properties would be pre-printed to leave clear windows or

tinted, opaque or other regions to correspond with desired viewing of the hologram.

The area of the packaging film which exhibits the optical variable effect could be overprinted with a transparent yellow lacquer so as to tint the diffractive appearance. Additionally, opaque white or other opaque coatings could be applied, for example in the manner taught in WO 92/16378. Visible and invisible printing may be used. Printed indicia and bar codes could also be added. In practice, the printed inks would be applied when the tubing was flat. At this time a tamper indicating security item in the form of a linear ribbon-like tape would be applied by, for example, hot lamination and the flat sheet formed into tubing by forming a seam. The tape could have a straight edge or a serrated or deckled edge.

Printing ink markings could be provided onto the inner surface of the holographic layers before the seal is shrunk into place. The shrunk seal would then not only exhibit the holographic effect but also visually display printing which being on the inaccessible side of the seal would be difficult to alter.

The print provided on the inner surface could be variable, for example to record batch numbers and be applied as toner or jetted ink or the like.

In order to seal the substrate to the article it would be typical to use a plastic for the substrate which did not deform below 150 degrees centigrade and to employ hot air jets for the bonding and optionally shrinking, which have a temperature of 120 degrees centigrade. Care must naturally be taken to ensure that the article is not itself damaged by a short exposure to the hot air.

In another embodiment, a strong plastic tear strip combined with perforations may be included along the line of the optically variable effect generating device bonded to it by the hot melt adhesive to allow the packaging to have a tear line.

Any attempt to peel off the wrapping film is likely to cause the weak layer between the reflective metal or other reflective coating and the diffractively profiled plastic to part irreversibly so immediately spoiling the visual appearance.

The heat activatable layer may alternatively be a resin or other material extruded, coated or otherwise bonded to the carrier film to which it is effectively permanently bonded. The bonding between the layers may be enhanced by the use of priming layers, electrical corona treatment or the like.

By arranging that the holographic device is bonded to the opposing surfaces, any attempt to delaminate is likely to cause the weaker interfacial bond within the hologram, i.e. between the diffracting surface and the reflective material to come apart in an unexpected, irreversible and thus tamper evident manner. Any attempt to reconstruct even a genuine packaging seal which has been tampered with is likely to be detected as the seal will be invalidated by the failure of the holographic or other optically variable security device.

Tamper evident holographically embossed material can be incorporated into the shrink sleeve product during manufacture. Strips of holographic material, e.g. width 5 to 20mm, will be held in position along the shrink sleeve material by a self-adhesive layer. The other side of the material would be coated with a heat activatable adhesive, so that during heat shrink application the hologram is now bonded on both sides - to the sleeve and to the object. Attempted removal of the hologram will result in the destruction of the holographic image.

Solvent, extruded or water-based heat seal adhesives could be used. This adhesive activation temperature must be such that bonding occurs, but the process must be controlled so that the holographic layer is not damaged.

The incorporation of an optically variable microstructure within a shrink sleeve heightens the level

of protection of the product against both counterfeiting and tampering. Registering the holographic image with a range of security printed features provides an integrated product ideally suited for brand and revenue protection.

5 As explained above, the substrate will typically be in the form of a tape or ribbon having a width of a few mm, e.g. 1-2mm (termed a thread) upwards. Preferred widths are 15-25mm to allow viewing of the optically variable effect and ease of manufacture. The term "tape" will be used  
10 hereafter to refer to a length of substrate of any width.

Some examples of tamper evident security items and methods according to the invention will now be described with reference to the accompanying drawings, in which:-

Figure 1 is a schematic, cross-section through a first  
15 example of a tamper indicating security item (not to scale);

Figure 2 illustrates a method for applying the item in Figure 1 to a shrinkable film;

Figure 3 illustrates the formation of a tube ready for  
20 securement; and,

Figure 4 is a view similar to Figure 1 but of a second example.

Figure 1 illustrates a tamper evident embossed tape having a single ply based structure. The substrate  
25 comprises a polypropylene film 1 having a thickness in the range 25-50 microns and a width in the range typically 5-20mm. One surface of the film 1 is embossed as shown at 2 with a holographic structure and this embossed surface is coated with a vacuum deposited layer of aluminium 3 having  
30 a thickness typically of 20nm. The embossed surface of the film 1 is suitably treated, for example by corona discharge, so as to control the level of bonding to the aluminium layer 3. This bond should not be too strong so that it is tamper evident. A high performance (pressure  
35 sensitive) acrylic adhesive layer 4 having a thickness of 10-20 microns is applied to the aluminium layer 3 from a release coated silicone resin carrier 5. The release

carrier 5 is typically paper and the carrier will have a weight typically in the range 50-80 gsm.

5 The other surface of the film 1 carries a hot melt or heat activatable adhesive layer 6 having a thickness in the range 10-20 microns.

10 In an alternative structure (not shown), it would be possible and may be desirable to employ the reverse situation whereby the aluminium 3 is coated with hot melt reactivatable adhesive whilst the substrate carrying the embossed layer 1 is laminated with high performance pressure sensitive acrylic adhesive on a silicone coated carrier.

15 Thus, in this case, the adhesive would be applied after removal of the release carrier to the inside of the heat shrinkable film and the hot melt on the aluminium profile would bond under application conditions to the article. The aluminium embossed profile would thus face the article.

20 The tape shown in Figure 1 will be formed in a long length of several hundred metres and will be stored on a reel 7 as shown in Figure 2. Figure 2 illustrates the continuous in-line application of the material shown in Figure 1 onto a shrinkable film 8. The tape 9 is unwound from the reel 7 and initially the release layer 5 is peeled away revealing the pressure sensitive adhesive 4. The partially delaminated tape 9 is then fed between a pair of nip rollers 10 between which is also fed the moving film 8. The two components are arranged to be fed at substantially the same speed and the rollers 10 form a nip so that the tape 9 is pressed onto the film 8 thus activating the adhesive 4. The consolidated material is fed on between a pair of rollers 11 to a take-up roller (not shown). It will be appreciated that the adhesive layer 6 is uppermost in Figure 2 and remains inactive.

35 The resultant, consolidated material is then steadily formed into a continuous tube by bending and welding it (for example by using solvent bonding) to form a seam.

This is then cut to suitable lengths and pre-shrunk by placing each length 12 over a former 13 (Figure 3) and subjecting the material 12 to hot air to form a loose fitting sleeve. The holographic tape is shown at 14. The  
5 mould 13 is suitably treated so that it will not adhere to the adhesive layer 6.

The pre-shrunk tube is then ready for use as a security seal. In use, the tube is placed over an article to be secured, for example the top of a bottle. Once  
10 placed over the bottle top, the tube is subjected to hot air which activates the adhesive 6 so that not only does the tube 12 shrink closely around the bottle top but in addition the adhesive 6 adheres the tape 14 to the bottle top.

15 If any attempt is made to remove the shrink wrapped tube 12 from the bottle top, this will destroy or at least damage the embossed hologram within the tape 14, for example by partially delaminating the tape structure since the adhesive bond between the tape 14 and the bottle top  
20 due to the adhesive layer 6 is stronger than the interlaminar bonds. The pressure sensitive adhesive 4 is also sufficient to prevent the film 8 being delaminated from the tape.

A second example of a tape is shown in Figure 4. In  
25 this example, the hologram is provided by embossing the lacquer layer 20 on a release treated carrier layer, for example polyethylene or polypropylene 21. The other surface of the layer 21 carries a pressure sensitive adhesive 22 covered by a release paper 23.

30 The embossed lacquer layer 20 is covered by a vacuum deposited layer of aluminium or the like 24 and this is joined to a thin, clear carrier layer 25 of for example polyethylene by a pressure sensitive adhesive layer 26. The other surface of the carrier layer 25 is provided with  
35 a hot melt or heat reactivatable adhesive 27.

This tape can be used in exactly the same way as the tape shown in Figure 1. The adhesive 22 will bond to the

packaging film and the adhesive 27 will bond to the product. In this case, however, when the seal which is formed when the tube has been shrunk wrapped onto the product is removed, the tape will split between the carrier layer 21 and the embossed lacquer layer 20. This means that the exposed surface on the product is holographic and is non-tacky which is preferred in some applications. This layer cannot be removed from a product due to the strength of the adhesive 22.

10        In the examples shown in Figures 1 to 3, the hologram will be viewed through the film 8, and the pressure sensitive adhesive 4, both of which will need to be transparent or at least translucent in regions where the hologram is to be viewed. In the Figure 4 example, the  
15        hologram will be viewed, in situ, through the packaging film, the adhesive 22, the release carrier 21, and the embossed lacquer layer 21, all of which will need to be transparent in regions where the hologram is to be viewed.



CLAIMS

1. A tamper indicating security item comprising a substrate including an optically variable effect generating structure, each surface of the substrate carrying an adhesive having a strength such that after the substrate has been adhered to a surface it cannot be removed without damaging the optically variable effect generating structure.
2. An item according to claim 1, wherein the adhesive used on one surface of the substrate is different from that used on the other surface.
3. An item according to claim 1 or claim 2, wherein one of the adhesives is chosen from the group comprising an hot melt adhesive, an heat activatable adhesive, a pressure sensitive adhesive and a polymeric laminating film.
4. An item according to claim 3, wherein the other adhesive is chosen from the group comprising an hot melt adhesive, a heat activatable adhesive, a pressure sensitive adhesive, and a hot melt adhesive cross linkable in nature such as UV cured acrylic or epoxy.
5. An item according to claim 4, when dependent on claim 3, wherein the one adhesive is selected from a hot melt adhesive or a pressure sensitive adhesive, and the other adhesive is a hot melt adhesive.
6. An item according to any of the preceding claims, wherein the adhesives are transparent.
7. An item according to any of the preceding claims, wherein at least one of the adhesives includes a marking material such as a visible dye, a luminescent material, and/or a magnetic material.
8. An item according to claim 7, wherein the marking material defines a code.
9. An item according to any of the preceding claims, wherein the optically variable effect generating structure is formed by a number of alternating coatings of a metal

and another metal or a light refracting coating such as magnesium fluoride or zinc sulphide.

10. An item according to any of claims 1 to 8, wherein the optically variable effect generating structure comprises a surface relief pattern in the substrate.
11. An item according to any of claims 1 to 8, wherein the optically variable effect generating structure comprises a surface relief pattern in a lacquer layer on the substrate.
12. An item according to claim 11, wherein the lacquer layer is provided on a carrier.
13. An item according to claim 11 or claim 12, wherein the lacquer layer is bonded to the substrate by an adhesive, preferably a pressure sensitive adhesive.
14. An item according to any of the preceding claims, wherein the optically variable effect generating structure generates a hologram.
15. An item according to any of the preceding claims, wherein the substrate is self-supporting.
16. An item according to claim 15, wherein the substrate is a plastics film.
17. An item according to claim 16, wherein the plastics film is chosen from the group comprising poly(vinyl chloride), poly(propylene), poly(ethylene), poly(ethylene terephthalate) or other polyester, a polyacrylic or polyacrylate, poly(vinylidene chloride) or poly(styrene).
18. An article joined to a film via a substrate including an optically variable effect generating structure, and adhesive provided between each surface of the substrate and the article and the film respectively.
19. An article according to claim 18, wherein the film is selected from a biaxially orientated thermoplastic film or a monoaxially orientated thermoplastic film.
20. An article according to claim 18 or claim 19, wherein the film also carries an optically variable effect generating structure.
21. An article according to any of claims 18 to 20, wherein the film is in the form of heat shrinkable tubing.

22. An article according to any of claims 18 to 21, wherein the substrate is provided by a tamper indicating security item according to any of claims 1 to 17.

23. An article according to any of claims 18 to 22,  
5 wherein the article is partially or completely packaged by the film.

24. A method of joining two surfaces, the method comprising adhering each surface to a respective side of a substrate including an optically variable effect generating  
10 structure using one or more adhesives, the or each adhesive having a strength such that after the substrate has been adhered to a surface it cannot be removed without damaging the optically variable effect generating structure.

25. A method according to claim 24, wherein the substrate  
15 is provided by a tamper indicating security item according to any of claims 1 to 17.

26. A method according to claim 25, wherein one surface is defined by an article and the other surface by a packaging film, the method further comprising partially or completely  
20 packaging the article with the packaging film.

27. A method according to claim 26, wherein the adhesive which bonds to the article is a heat activatable adhesive, and the packaging film is heat shrinkable, the method comprising heating the film when located relative to the  
25 article so that the film shrinks onto the article and the adhesive is activated to bond the film to the article.

Application No: GB 9603493.9  
 Claims searched: 1 to 27

Examiner: R.J.MIRAMS  
 Date of search: 30 May 1996

**Patents Act 1977**  
**Search Report under Section 17**

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:  
 UK Cl (Ed.O): B5N; B8T (TTT)  
 Int Cl (Ed.6): B65D 27/30, 33/34, 55/02, 55/06; C09J 7/02; G09F 3/02  
 Other: ONLINE: WPI, CLAIMS

**Documents considered to be relevant:**

Category	Identity of document and relevant passage	Relevant to claims
X	EP0,345,405A2 (Arysearch Arylan) e.g. figures 3 and 4	at least 1, 6, 10, 14, 15, 16, 17, 24, 25
X	US5,005,719A (Phillips) whole document	at least 1, 3, 4, 9, 15, 16, 17, 24, 25

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